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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|----------------------|---------------------|------------------|
| 10/517,529 | 12/13/2004 | Akira Unno | 03500.017331 | 7094 |

5514 7590 08/30/2006

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EXAMINER

INGHAM, JOHN C

ART UNIT PAPER NUMBER

2814

DATE MAILED: 08/30/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

| | | | |
|------------------------------|--------------------------------------|------------------------------------|--|
| Office Action Summary | Application No. 10/517,529 | Applicant(s) UNNO, AKIRA | |
| | Examiner John C. Ingham | Art Unit 2814 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 08 August 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-3 and 5-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 17 and 18 is/are allowed.
- 6) ☒ Claim(s) 1-3, 5-10, 14-16, 19 and 20 is/are rejected.
- 7) ☒ Claim(s) 11-13 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 16 February 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. The amendments to the claims filed on 8 August 2006 have been entered.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims **1-3, 5-10, and 14** are rejected under 35 U.S.C. 103(a) as being unpatentable over Jackson in view of Parikh.
4. Regarding claims **1, 2 and 14**, Jackson discloses in Figure 4 an organic semiconductor element comprising a gate electrode, a gate insulating layer (gate dielectric), an organic semiconductor layer (90°C pentacene), and source/drain electrodes formed on a surface of a substrate. Jackson does not disclose wherein the organic semiconductor element further comprises a protective film or an island-shaped protrusion layer having dispersed and island-shaped protrusions with a low surface energy provided in contact with the organic semiconductor layer, but does disclose an OTS layer (orientation layer) between the gate dielectric and organic layer.

It would have been well known and obvious to one of ordinary skill in the art at the time of the invention to add the protective film to the structure recited by Jackson.

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Motivation to do so includes the necessity of a passivation layer covering sensitive electronic components, well known in the art.

Parikh discloses in the abstract and first paragraph of the introduction a description of an OTS layer molecular structure. Namely, in lines 10-12 of the abstract Parikh discloses that the OTS film exhibits closely spaced islands, arranged vertical to the substrate surface, with a coverage dependant on temperature. It would have been obvious to one of ordinary skill in the art at the time of the invention to use the teachings of Parikh to describe the island structure of the layer between the gate dielectric and organic layer of an OTFT, since highly organized films grow on the OTS layer as described (Jackson pg 102 paragraph 2), as well as having control over the surface energy depending on temperature, as disclosed in the abstract and on page 7581 (Parikh section 3.2 paragraph 2).

The combination of teachings from Jackson and Parikh (plus the well known passivation layer) results in a structure with a gate electrode, gate insulating layer, OTS film with island-shaped protrusions, organic layer, source/drain electrodes, and protective film on a surface of a substrate. The island-shaped protrusion layer resides between gate dielectric and organic layers, satisfying the limitation that the island-shaped protrusion layer is provided in contact with the organic semiconductor layer. The language, "wherein the island-shaped protrusion layer is formed by spin coating or spray coating, the organic layer formed after forming the island-shaped protrusion layer" describes a product by process. See MPEP 2113. "[E]ven though product-by-process claims are limited by and defined by the process, determination of patentability is based

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on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process.” *In re Thorpe*, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985).

5. Regarding claims **3, 5, and 6**, Jackson and Parikh disclose the organic semiconductor element according to claim 1, but do not teach the four rearrangements of layers recited in claims 3-6. However, regardless of the layer order, the organic material acts as the active layer and the gate dielectric layer is separated from the active layer by the island-shaped protrusion layer. It would have been obvious to one of ordinary skill in the art at the time of the invention to change the order of layers to provide different means to make contact with the source, drain, and gate electrodes. See *In re Japikse*, 181 F.2d 1019, 86 USPQ 70 (CCPA 1950).

6. With regards to claim **7**, Parikh discloses in Figure 1 that the surface energy of the OTS layer is dependent on preparation temperature, and the graph shows surface energy (surface tension) of the layer as below 30 dyne/cm.

7. Regarding claim **8**, Parikh discloses in Figure 2 that the proportion of the island-shaped protrusions dispersed in the island-shaped protrusion layer (film coverage) decreases as preparation temperature increases. Above 35°C, the coverage satisfies the limitation that the proportion of coverage is 10-95%.

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8. With regards to claim **9**, Parikh discloses in the caption of Figure 2 that the figure is derived from a normalized film thickness of 26.2\AA (2.62nm), satisfying the limitation that the height of the island-shaped protrusions is 0.2 to 150 nm.

9. Regarding claim **10**, Parikh discloses in column one on page 7586 (paragraph 4) that an average surface coverage of 90% results in close packed islands of 50\AA (5nm) width, satisfying the requirement that the average diameter of the island-shaped protrusions is 0.1 to 100 nm.

10. Claims **15 and 16** are rejected under 35 U.S.C. 103(a) as being unpatentable over Jackson and Parikh as applied to claim 1 above, and further in view of Shi et al.

11. Regarding claim **15**, Jackson and Parikh disclose the organic semiconductor element according to claim 1, but do not disclose wherein the organic semiconductor layer has periodicity with respect to a surface normal direction of the gate insulating layer (periodicity meaning a successive stacking of a single layer composed of pentacene molecules). Regarding claim **16**, Jackson and Parikh disclose the organic semiconductor element according to claim 1, but do not disclose wherein the organic semiconductor layer is made of a film of a pentacene derivative with a C-axis orientation of 85% or more.

Shi et al. teaches organic films made of pentacene derivatives (col 5 ln 19-21), used to advantage based on their low cost and simple application process (spin-coating and vacuum evaporation, col 1 ln 28-30). Shi also discloses in column 5 lines 2-3 that the organic material is deposited on top of an orientation film. In reference to the claim

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language pertaining to the C-axis orientation, the claiming of a new use, new function, or unknown property, which is inherently present in the prior art, does not necessarily make the claim patentable. (*In re Best*, 195 USPQ 430, 433 (CCPA 1977) and *In re Swinehart*, 439 F. 2d 210, 169 USPQ 226 (CCPA 1971); please see MPEP § 2112). Since Jackson, Parikh and Shi show all the features of the claimed invention, the characteristic C-axis orientation is an inherent property of the invention. It would have been obvious to one of ordinary skill in the art at the time of the invention to use a derivative of pentacene as an organic thin film because of its low cost.

Shi et al. also teaches in column 5 lines 2-5 that the organic material stacks with pi-electron overlapping aligned in the source to the drain direction, since the alignment and stacking creates the highest mobility in the source to drain direction within the organic material (Shi, col 4 ln 55-57). It would have been obvious to one of ordinary skill in the art at the time of the invention to perform the above described stacking in order to create high mobility.

12. Claims **19 and 20** are rejected under 35 U.S.C. 103(a) as being unpatentable over Jackson and Parikh as applied to claim 1 above, and further in view of Baumbach. Jackson and Parikh disclose the device of claim 1, but fail to specify that the device may be utilized as an active matrix element, or an IC information electronic tag.

Baumbach teaches in column 2, lines 7-10 that organic TFTs may be utilized in an active matrix type display or an IC information electronic tag. However, intended use and other types of functional language must result in a structural difference between the

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claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art (MPEP 2111). If the prior art structure is capable of performing the intended use, then it meets the claim. In re Casey, 152 USPQ 235 (CCPA 1967); In re Otto, 136 USPQ 458, 459 (CCPA 1963).

Allowable Subject Matter

13. Claims **11-13** are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

14. The following is a statement of reasons for the indication of allowable subject matter: the prior art does not disclose or render obvious the claimed device wherein island-shaped protrusions with the low surface energy are made of polyimide, polyamide, poly-fumarate-based polymers, cyclic perfluoropolymers, fluoroalkylsilane compounds, or perfluoroether based compounds.

15. Claims **17-18** are allowed.

16. The prior art does not disclose or render obvious the method of claim 17, wherein the island-shaped protrusions are formed by spin or spray coating, and the organic semiconductor layer is formed in contact with the island-shaped protrusions.

Response to Arguments

17. Applicant's arguments filed 8 August 2006, with regards to Jackson and Parikh, have been fully considered but they are not persuasive. The process of spin coating or

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spray coating describes a product by process and does not affect the OTS structure of device claims ~~1-3 and 5-16~~ ^{1-3 and 5-16} OK ✓

Conclusion

18. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to John C. Ingham whose telephone number is (571) 272-8793. The examiner can normally be reached on M-F, 8am-5pm.

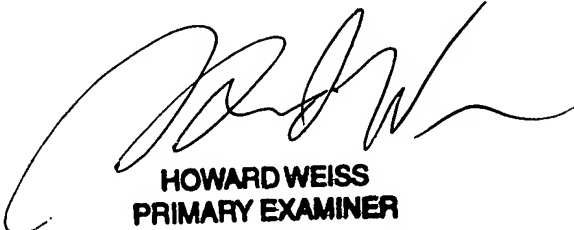
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on (571) 272-1705. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

John C Ingham
Examiner
Art Unit 2814

jci



HOWARD WEISS
PRIMARY EXAMINER